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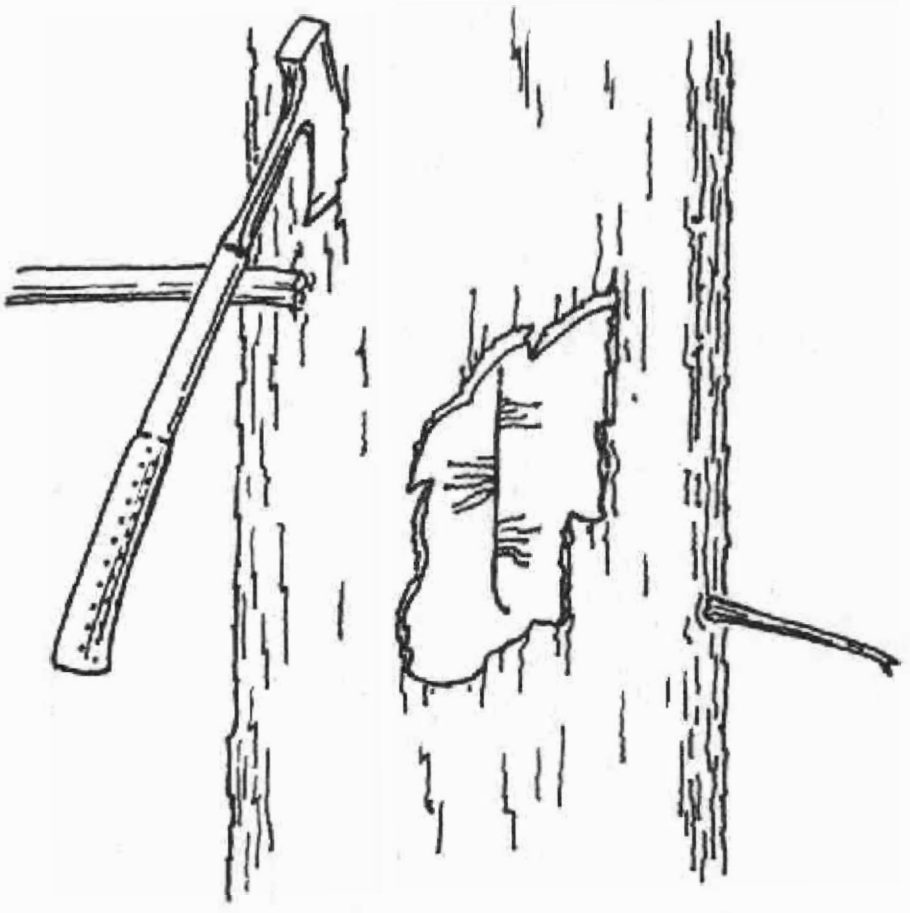
BARK BEETLE CONDITIONS
Northern Region
1992



Ken Gibson
and
Bob Oakes

Report 93-3
March 1993

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Northern Region
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United States Department of Agriculture

Forest Service
Northern Region
Missoula, Montana

Forest Pest Management

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INDEX

Page

INTRODUCTION 1

CONDITIONS IN BRIEF

Mountain Pine Beetle 2

Douglas-fir Beetle 7

Pine Engraver 7

Western Balsam Bark Beetle 11

Western Pine Beetle 11

Fir Engraver 11

Spruce Beetle 14

Red Turpentine Beetle 14

FOREST SUMMARIES

Beaverhead Reporting Area 14

Bitterroot Reporting Area 14

Clearwater Reporting Area 15

Coeur d'Alene (IPNFs) Reporting Area 15

Craig Mountains (ID) Reporting Area 15

Custer Reporting Area 15

Flathead IR 16

Flathead Reporting Area 16

Garnet Mountains (MT) Reporting Area 20

Gallatin Reporting Area 20

Helena Reporting Area 20

Kaniksu (IPNFs) Reporting Area 21

Kootenai Reporting Area 21

Lewis and Clark Reporting Area 21

Lolo Reporting Area 24

Nez Perce Reporting Area 24

St. Joe (IPNFs) Reporting Area 24

REFERENCES 27

SCIENTIFIC NAMES 27

LIST OF FIGURES

Figure 1 Mountain pine beetle in Northern Region (all host species), 1992 3
Figure 2 Mountain pine beetle in western white pine in northern ID and western MT, 1992 6
Figure 3 Douglas-fir beetle in Northern Region, 1992 8
Figure 4 Ips in lodgepole pine in Montana, 1992 10
Figure 5 Western balsam bark beetle in Northern Region, 1992 12
Figure 6 Fir engraver in northern Idaho, 1992 13
Figure 7 Mountain pine beetle in lodgepole pine, Flathead Reporting Area, 1992 17
Figure 8 Mountain pine beetle in western white pine, Flathead Reporting Area, 1992 18
Figure 9 Mountain pine beetle (all host species), Kootenai Reporting Area, 1992 22
Figure 10 Mountain pine beetle (all host species), Lolo Reporting Area, 1992 25

LIST OF TABLES

Table 1 Acres under Federal jurisdiction in the Northern Region 4
Table 2 Acres of State and private ownership in the Northern Region 5
Table 3 Aerially observed infested acres and mortality attributed to DFB in Northern Region 9
Table 4 Acres of host infested and species per acre killed by MPB Flathead 19
Table 5 Acres infested and trees per acre killed by MPB Lolo 23
Table 6 Acres infested and trees per acre killed by MPB Kootenai 26

BARK BEETLE CONDITIONS
Northern Region, 1992

Ken Gibson and Bob Oakes

INTRODUCTION

In 1978, in response to the need to provide more detailed information on the massive and destructive bark beetle--predominantly mountain pine beetle--outbreaks occurring in the Region, we prepared a "Bark Beetle Conditions" report (McGregor, et al, 1979). That report, separate from the yearly, Regional Conditions Report enabled us to report more specifically on individual outbreaks, their impacts, and predicted trends. That format was continued on a somewhat irregular basis until 1983 when the report focused solely on mountain pine beetle (McGregor, et al, 1983). Beginning in 1987, as mountain pine beetle populations continued a gradual decline, and other bark beetles, e.g., Douglas-fir beetle, became more locally prominent, we once again began preparing annual bark beetle conditions reports (Gibson and Oakes 1988). Since that time, we have attempted to reflect in these reports the status of bark beetle epidemics of local importance, on a District-by-District (or other ownership) basis.

In providing this information, we point out that the majority of our data is derived from the annual aerial survey of forested lands in our Region. Yearly, aerial surveys--conducted over Federal, State and private lands--cover approximately 28 of the 34 million forested acres in the Northern Region. Realizing that some areas are not flown from year to year, and that some error in recording information is inevitable, we know the aerial survey information is neither complete nor completely accurate. Until advancing technology provides improved, operational methods, however; this information is the best that is economically available.

A problem inherent in aerially surveying bark beetle outbreaks is that what is recorded in any one year are current-year faders. Those, of course, are trees that were attacked and killed the previous year. So, under the best of conditions, aerial survey information--relative to bark beetle population status--is 1 year old when we get it. To augment aerial survey information, and help offset the 1-year lag, we conduct ground surveys in as many bark beetle-infested areas as time and resources permit. During these surveys, conducted each fall following beetle flights, we collect data from either fixed- or variable-radius sample plots. At each plot we measure not only current- and previous-year beetle damage, but "green" stand data as well. In that way, we are able to more accurately assess past, current, and future population trends. That system, also, is not flawless. And in any particular year, we are unable to cover all the infested areas we would like to cover.

This "disclaimer" is not meant to lessen the value of the data we have. Rather, it is included to inform the reader that the information in this report, while the best at our disposal, does have limits on how widely it should be extrapolated. Aerial survey information relative to an infested area is quite accurate. Estimates of dead trees from those surveys are less so. Ground-collected data, on the other hand, provides an accurate accounting of mortality for a small geographic area. That data, however, cannot be accurately expanded to a particular drainage, planning unit or district. The best we can probably say about it is that it reflects conditions in those stands where it was collected. In stands of like characteristics, the probability that similar mortality or beetle-caused impacts may occur is high.

CONDITIONS IN BRIEF

Mountain Pine Beetle (MPB)

Mountain pine beetle populations continued a decade-long decline, having peaked in 1981 at nearly 2.5 million acres infested in the Northern Region alone. In 1991, approximately 163,000 acres were infested (Oakes and Gibson 1992). Aerial survey estimates showed total infested area decreased by half in 1992--to just less than 80,000 acres (Figure 1). In Montana, the infested area in 1991 had totaled almost 149,000 acres. In 1992, that area had declined to just over 66,000 acres. Aerial survey estimates generally total about three trees per acre per year killed. In many stands, however, beetle-caused mortality is much higher--often approaching 90 percent of the trees over 5 inches in diameter, over the course of an infestation.

The most active infestations in Montana remain on the Flathead National Forest (NF) where approximately 2,600 acres of western white pine (WWP) type and another 4,200 acres of lodgepole pine (LPP) type were infested--mostly on the Glacier View, Hungry Horse, and Swan Lake Ranger Districts (RD); the Lolo NF where nearly 17,000 acres of LPP (Plains/Thompson Falls RD) and lesser amounts of other host species harbor outbreak populations; and the Kootenai NF with more than 33,000 acres--most of which is LPP on the Three Rivers, Rexford and Fisher River RDs--still infested. Smaller, scattered infestations in most host species are found on lands of other ownerships throughout the State. Notably, approximately 4,000 acres--total, Statewide--of ponderosa pine (PP) stands contained beetle-killed trees (Tables 1 and 2). While many outbreaks are returning to nearly endemic conditions, there remains much LPP in many parts of western Montana that will become increasingly susceptible to the beetle in the next decade or two.

A field experiment to test the effectiveness of verbenone and ipsdienol in masking the attraction of standard MPB attractant lures was conducted in LPP and WWP stands on the Hungry Horse RD, Flathead NF. Detailed results are being analyzed. Preliminary information showed that verbenone alone was as effective as a combination of verbenone and ipsdienol. That information is of great importance as we attempt to develop management strategies for MPB using naturally-occurring pheromones.

In northern Idaho, the area containing beetle-caused mortality, in all hosts, increased from just over 2,200 acres in 1991, to more than 13,300 acres in 1992. Nearly 17,000 trees were estimated to have been killed. The largest increases were recorded in WWP stands on the Bonners Ferry and Sandpoint RDs, Idaho Panhandle National Forests (IPNFs); and Pierce and North Fork RDs, Clearwater NF (Figure 2). We were not able to ground check many of those infested stands and so are not certain that those increases in mortality all occurred in one year--nor if, indeed, it is all attributable to MPB. It is possible that more than one year of mortality, and/or mortality due to blister rust was recorded by the aerial observer. We are not, therefore, capable of predicting the current trend of those infestations.

LPP stands infested in northern Idaho were located on the Bonners Ferry RD, and the Nez Perce Indian Reservation (IR). Smaller, scattered groups were noted on the Mica State Forest (SF), Pierce RD and Red River RD, Nez Perce NF. In total, nearly 2,500 acres were infested. An estimated 4,300 trees were killed.

Nearly 1,600 acres of PP stands showed some level of beetle-caused mortality in northern Idaho, most of which was recorded in the Craig Mountains and on the Nez Perce IR. Slightly less than 4,000 trees were killed. Small, scattered groups of whitebark pine mortality, attributable to the beetle, were observed on the Nez Perce and IPNFs. Fewer than 500 acres, total, were infested; and less than 200 trees were reported killed.

Figure 1.--Mountain pine beetle in Northern Region (all host species), 1992.

Table 1.--Acres under Federal jurisdiction in the Northern Region on which MPB-caused mortality was aerially observed, 1991 and 1992.

	------ 1991 ------				------ 1992 ------			
Area	LPP[1]	PP	WBP	WWP	LPP	PP	WBP	WWP
Beaverhead NF	489	-	-	-	2,041	6	138	-
Bitterroot NF	91	363	-	-	8	66	-	-
Clearwater NF	20	2	2	8	121	-	-	1,255
Custer NF	38	-	-	-	-	40	2	-
Deerlodge NF	960	2	-	-	168	-	-	-
Flathead NF	4,785	28	118	8,349	4,129	28	80	2,623
Gallatin NF	1,408	2	101	-	275	-	160	-
Helena NF	509	44	4	-	291	36	44	-
IPNFs	304	3	-	102	1,264	28	12	6,662
Kootenai NF	104,117	793	4	540	31,616	782	48	533
Lewis & Clark NF	-	42	-	-	212	153	149	-
Lolo NF	24,537	188	6	119	15,928	803	2	54
Nez Perce NF	506	-	81	6	337	128	469	83
Total NF	**137,764**	**1,467**	**316**	**9,124**	**56,390**	**2,070**	**1,104**	**11,210**
Glacier NP	*	*	*	*	*	*	*	*
Yellowstone NP	*	*	*	*	*	*	*	*
Blackfeet IR	*	*	*	*	*	*	*	*
Crow IR	-	44	-	-	*	*	*	*
Flathead IR	893	145	-	2	380	1,128	-	-
Fort Belknap IR	*	*	*	*	76	143	-	-
N. Cheyenne IR	-	40	-	-	*	*	*	*
Nez Perce IR	2	-	-	-	294	310	-	-
Rocky Boy's IR	*	*	*	*	91	60	-	-
BLM (Total)	**141**	**14**	**2**	**13**	**313**	**47**	**54**	**114**
Total (Non-NF)	**1,036**	**243**	**2**	**15**	**1,154**	**1,688**	**54**	**114**
Total Federal	**138,800**	**1,710**	**318**	**9,139**	**57,544**	**3,758**	**1,158**	**11,324**

[1]LPP = Lodgepole pine; PP = ponderosa pine; WBP = whitebark pine; WWP = western white pine

* Not flown.

Table 2.--Acres of State and private ownership (within the following reporting areas) in the Northern Region on which MPB-caused mortality was aerially observed, 1991 and 1992.

	1991				1992			
Area	LPP[1]	PP	WBP	WWP	LPP	PP	WBP	WWP
Beaverhead NF	16	-	-	-	127	-	2	-
Bitterroot NF	2	1,051	-	-	2	68	-	-
Clearwater NF	-	4	-	-	2	-	-	16
Custer NF	2	-	2	-	-	2	18	-
Deerlodge NF	304	-	-	-	88	2	-	-
Flathead NF	301	106	-	114	121	-	-	60
Gallatin NF	111	-	-	-	-	2	26	-
Helena NF	38	53	-	-	84	77	4	-
IPNFs	25	-	-	2	57	278	-	429
Kootenai NF	3,184	146	-	12	540	64	-	20
Lewis & Clark NF	-	51	-	-	8	24	45	-
Lolo NF	3,089	278	-	-	749	170	2	-
Nez Perce NF	749	-	6	-	-	4	-	-
Garnets	24	233	-	-	18	132	-	-
Stillwater SF	461	30	-	988	48	2	10	261
Swan River SF	22	-	-	204	2	-	-	26
Thompson River SF	366	38	-	-	279	70	-	-
Cataldo FPD*	30	-	-	2	-	8	-	96
Craig Mtn. FPD*	376	660	2	-	54	483	-	-
Kendrick FPD*	2	2	-	-	18	-	-	-
Kootenai Valley FPD*	-	-	-	-	2	-	-	139
Maggie Cr. FPD*	-	4	-	-	4	33	-	-
Mica FPD*	10	144	-	-	181	131	-	18
Pend Oreille	17	31	-	-	121	36	-	144
W. St. Joe	8	2	-	-	13	104	-	-
Total	**9,137**	**2,833**	**10**	**1,322**	**2,518**	**1,690**	**107**	**1,209**

[1]LPP = Lodgepole pine; PP = ponderosa pine; WBP = whitebark pine; WWP = western white pine

*FPD = Fire Protection District

Figure 2.--Mountain pine beetle in western white pine in northern Idaho and western Montana, 1992.

Douglas-Fir Beetle (DFB)

Outbreak populations of DFB continued to plague areas on several Forests in Montana where epidemics followed stand-disturbing factors such as windthrow, winter desiccation, fire, and drought effects. Total infested area in the State was 9,450 acres--up slightly from the more than 8,000 acres infested in 1991 (Figure 3). Of that total, more than 4,500 acres were on the Gallatin NF, in the Mill Creek drainage (Livingston RD), where a serious outbreak exists. That epidemic, resulting from windthrow and fire, is being controlled through an active salvage program and the judicious use of pheromone tree baits. Other significant outbreaks are on the Beaverhead NF, where more than 1,100 acres are still infested on the Dillon and Madison RDs; the Helena NF, with nearly 1,000 infested acres on and surrounding the Lincoln RD; the Lolo NF with just over 600 acres infested, and the Kootenai and Flathead NFs, where approximately 500 acres are infested on each Forest. We estimate that in all these infestations, almost 13,000 Douglas-firs (DF)--representing approximately 4 million board feet (MMBF) volume--were killed in 1991 (1992 faders) (Table 3). Ground evaluations following aerial surveys showed still-active populations in some areas; however, in many, populations are declining as a result of more nearly normal amounts of precipitation.

In northern Idaho, the area infested increased significantly--from approximately 5,300 acres in 1991 to more than 14,800 acres in 1992. Nearly 30,000 trees were estimated to have been killed, more than twice as many as in the preceding year. Most observed increases occurred on the Nez Perce NF, near the confluence of the Lochsa and Selway Rivers.

Substantial blowdown, experienced in many parts of northern Idaho in 1991, may indicate increased beetle populations again in 1993. Windfall infested in spring 1992, if not salvaged prior to beetle flight in 1993, will provide a source of beetles which could result in an expansion of the infested area in the coming year.

Pine Engraver (IPS)

IPS, not usually an aggressive bark beetle--and therefore not known for long-lasting nor particularly devastating outbreaks--continued to kill trees in significant amounts in LPP stands on the Gallatin NF and in PP stands on the Northern Cheyenne Indian Reservation (IR) during 1992 (Figure 4). Outbreaks on the Gallatin NF, resulting from trees weakened by fires in 1988 and the ensuing several years of near-drought conditions in southwest Montana, have expanded to more than 27,000 acres. Nearly 6,500 of those acres are on the Hebgen Lake RD--in stands adjacent to ones burned in and near Yellowstone National Park (NP). Another 6,900 acres are on the Bozeman RD--predominantly in the southern portion of the Gallatin Canyon. Almost 5,000 acres were recorded in the Boulder River drainage on the Big Timber RD. An additional 2,100 acres of beetle-killed LPP were recorded on the Beartooth RD of the Custer NF. Ground surveys suggest populations are declining--but beetles will continue to kill trees in those areas as long as drought-weakened trees remain.

Though not all of the Northern Cheyenne IR was flown in 1992, outbreaks in PP stands there extend to several thousand acres. That outbreak has been exacerbated by nearly-continuous slash creation and abnormally dry weather. A research project currently being conducted on the Reservation has determined that many of the *Ips* species being caught there are *I. plastographus* (LeConte). It is conceivable that that species may be more commonly encountered in eastern Montana than we had supposed.

Damage attributable to IPS populations remained low in northern Idaho in 1992. A mere two acres with some mortality was recorded during aerial surveys, compared with 15 acres in 1991. Pheromone-baited flight traps caught many beetles throughout the flight season, beginning in mid-March. The high number of beetles caught during the year is an indication that PP damage caused by IPS could increase in 1993.

In 1992, we conducted a pilot project--replicated in both northern Idaho and western Montana--to test the effectiveness of the anti-aggregant properties of the pheromones verbenone and ipsenol. In that initial test, we measured their affect against the aggregative pheromones of the engraver beetle--ipsdienol and lanierone. Preliminary results are very promising. Further testing may result in pheromone treatments which can effectively prevent slash from being infested by beetles until it is sufficiently dry to no longer provide suitable habitat for brood development. Should such treatments become operational, they could prevent many engraver beetle outbreaks.

Figure 3.--Douglas-fir beetle in Northern Region, 1992.

Table 3.--Aerially observed infested acres and mortality attributed to DFB in the Northern Region by reporting area, 1991 and 1992.

	1991			1992		
Reporting Area	Acres	Trees	Vol. (MBF)	Acres	Trees	Vol. (MBF)
Beaverhead NF	1,395	1,607	321.4	1,137	1,264	252.8
Bitterroot NF	3,730	4,762	1,415.9	1,251	4,954	1,708.4
Clearwater NF	746	2,919	1,021.6	2,215	5,049	1,767.2
Custer NF	2	20	4.0	100	226	45.2
Deerlodge NF	165	176	35.2	191	281	56.2
Flathead NF	770	774	232.2	570	701	210.3
Gallatin NF	1,183	1,210	242.0	4,573	4,355	871.0
IPNFs	847	2,666	933.1	2,691	5,249	1,837.2
Helena NF	35	114	22.8	927	2,377	475.4
Kootenai NF	472	616	184.8	486	505	151.5
Lewis & Clark NF	-	-	-	275	544	108.8
Lolo NF	1,775	2,475	742.5	685	1,397	419.1
Nez Perce NF	1,368	3,580	1,253.0	6,967	8,468	2,963.8
Garnets	236	327	98.1	112	188	56.4
Swan River SF	111	155	46.5	28	43	12.9
Thompson River SF	57	146	43.8	22	55	16.5
Coeur d'Alene IR	-	-	-	8	40	14.0
Flathead IR	80	153	45.9	80	257	77.1
Ft. Belknap IR	*	*	*	2	10	2.0
Nez Perce IR	4	15	5.3	229	921	322.4
Rocky Boy's IR	*	*	*	44	75	15.0
Cataldo FPD	34	99	34.7	69	210	73.5
CLW/Potlatch FPD	136	481	168.4	196	566	198.1
Craig Mtn. FPD	52	210	73.5	473	705	246.8
Kendrick FPD	26	65	22.8	537	2,555	894.3
Kootenai Valley FPD	1	3	1.1	12	10	3.5
Maggie Cr. FPD	38	120	42.0	42	104	36.4
Mica FPD	29	105	36.8	51	190	66.5
Pend Oreille	40	104	36.4	62	165	57.8
Priest Lake	10	33	11.6	10	45	15.8
W. St. Joe	42	125	43.8	226	875	306.3
Total	**13,384**	**23,060**	**7,119.2**	**24,271**	**42,384**	**13,282.2**

*Not flown.

Figure 4.--Ips in lodgepole pine in Montana, 1992.

Western Balsam Bark Beetle (WBBB)

Outbreak populations of WBBB expanded significantly throughout the Region in high-elevation subalpine fir (SAF) stands. In Montana, where only 7,300 infested acres had been mapped in 1991, more than 56,500 acres--on which 38,000 dead trees were observed--were recorded in 1992 (Figure 5). Most of the infested areas are on the Gallatin and Beaverhead NFs, 32,400 acres and 22,500 acres, respectively. Much of the Gallatin infestation is found on the Bozeman and Hebgen Lake RDs and adjacent lands of private ownership. On the Beaverhead NF, most infested stands are in the Tobacco Root, Gravelly and Centennial Mountain ranges on the Sheridan and Madison RDs. Though not recorded on aerial survey maps, many infested stands were also observed on the Sula RD, Bitterroot NF.

In northern Idaho, similar increases--but of lesser magnitude--were observed. In 1991, just over 800 trees on 208 acres were reported. In 1992, those figures increased to nearly 4,400 trees and slightly more than 3,400 acres. Much of that mortality, more than 1,300 acres, was recorded on the Bonners Ferry RD, IPNFs, though notable increases were also found on the Clearwater and Nez Perce NFs. The remainder was generally scattered throughout the various reporting areas.

Ground surveys in both Idaho and Montana showed WBBB is indeed a major contributor to SAF mortality. However, the extenuating problems of drought, root disease, other secondary bark beetles, and overall stand decadence have contributed greatly to the significant increases in mortality attributed to this beetle.

Western Pine Beetle (WPB)

WPB populations in Montana were virtually unchanged in 1992 and remained at nearly-endemic conditions. Only 850 acres--totaling just 600 trees--of WPB-caused mortality were recorded in 1992, compared to just over 600 in 1991. No major outbreaks remain, but the largest concentrations were noted in PP stands on the Lolo and Bitterroot NFs and the Flathead IR in western Montana. Dry conditions are the major contributing factor in outbreaks of WPB. Increased moisture in affected stands has resulted in the ensuing population reductions over the past several years.

In northern Idaho, beetle activity continued a several-year decline. The little mortality recorded was noted on the IPNFs (Fernan RD), Mica SF and in the West St. Joe reporting area. About 4,800 trees were reported killed on 1,720 acres.

In May, several hundred high-value PP in Bells Bay Campground (Fernan RD, IPNFs) were treated with carbaryl insecticide to prevent WPB attacks. Evaluations following beetle flight showed the treatment to be completely successful.

Fir Engraver (FE)

The FE has never been a major problem in Montana--compared to northern Idaho--because of the relative scarcity of its primary host, grand fir (GF). A total of 350 trees were noted as having been killed by FE, on just over 230 acres, in 1992. We consider that to be nothing more than naturally occurring, endemic populations.

FE populations remained essentially static in northern Idaho in 1991. The infested area increased from 5,600 to approximately 14,000 acres; however, the number of trees estimated to have been killed--just less than 15,000--was about the same as in 1991 (Figure 6).

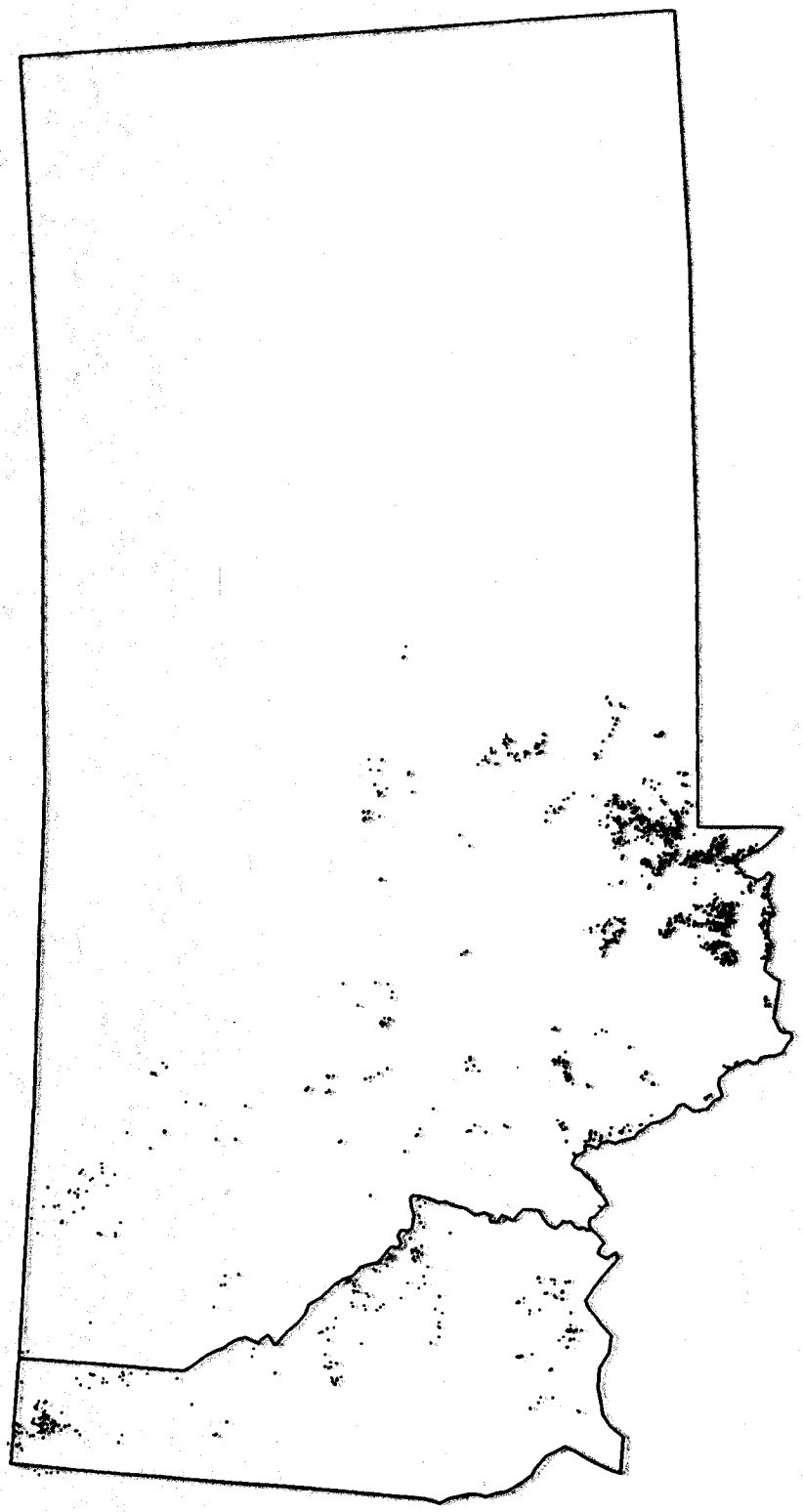

Figure 5.--Western balsam bark beetle in Northern Region, 1992.

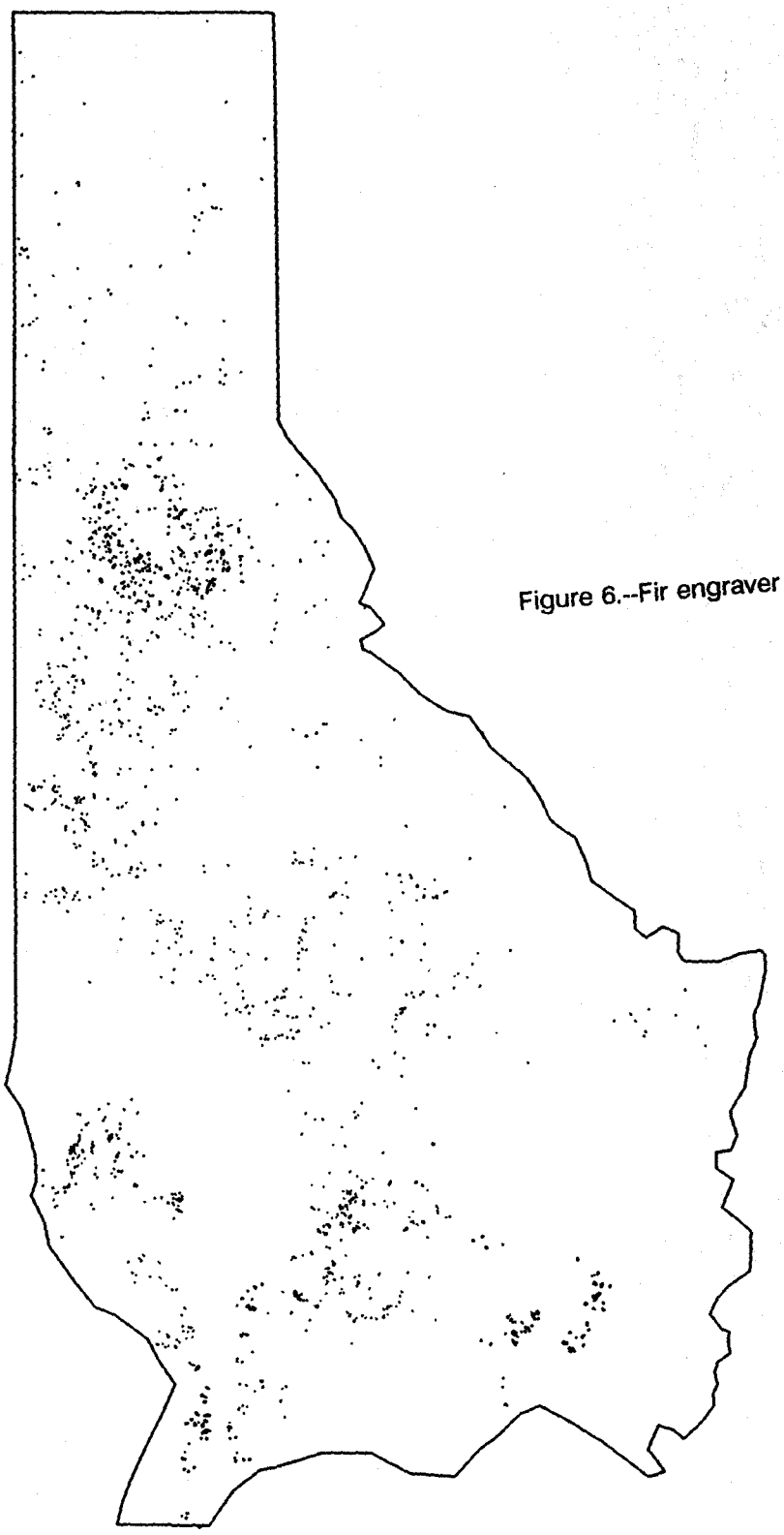

Figure 6.--Fir engraver in northern Idaho, 1992.

Spruce Beetle (ESB)

ESB populations are also found at only endemic levels in Montana at the present time. At times, ESB outbreaks cause significant amounts of mortality in old-growth Engelmann spruce (ES) stands following some type of disturbance. The most recent outbreak in Montana occurred in 1982-1984 on the Flathead and Kootenai NFs when more than 20,000 ES were killed on approximately 30,000 acres. In 1992, however, only 178 acres of ESB-caused mortality (133 trees) were recorded. Most of that mortality, just over 100 acres (but only 23 trees), were noted on the Musselshell RD of the Lewis and Clark NF.

In northern Idaho, the small outbreak on the Nez Perce NF increased slightly in area in 1992, but the number of trees killed were fewer. Last year, about 1,500 trees were killed on just over 1,100 acres. This year, 950 beetle-killed trees were recorded on 1,329 acres. Total area infested in Idaho, north of the Salmon River, was 1,576 acres. We anticipate a continued declining trend in 1993.

Large amounts of ES blowdown occurred on the Hungry Horse RD, Flathead NF and Bonners Ferry RD, IPNFs in the past couple of years. Timely salvage efforts conducted on the Hungry Horse RD prevented a serious outbreak in surrounding spruce stands. Ones planned on the Bonners Ferry RD should be equally successful, if already-infested trees are removed prior to beetle emergence.

Red Turpentine Beetle (RTB)

Though rarely a management concern, numerous WWP trees were killed by RTB in several plantations on the Palouse RD, Clearwater NF in 1992. The plantations had been treated for blister rust control by pruning infected trees and excising some cankers. Up to 41 percent of the pruned trees in one plantation had been subsequently attacked by beetles. Not all attacked trees were killed, but in one plantation, beetle-caused mortality reached 10 percent. The beetles are likely attracted by the terpenes emitted by the trees when pruned. Should this continue to cause unacceptable amounts of tree mortality, ameliorating actions may be warranted. Those could include preventive sprays or timing pruning activities so as not to coincide with beetle flights.

FOREST SUMMARIES

Beaverhead Reporting Area

SAF killed by WBBB increased significantly in the Tobacco Root Mountains, northwest of Ennis; in the Gravelly Range, south of Ennis; in the Centennial Mountains, south of Red Rock Lakes; in the heads of drainages on the western side of the Big Hole Valley, in the Bitterroot Range; and in scattered groups throughout the Pioneer Mountains.

DFB was reported in small, scattered groups throughout the DF type in the Jack Creek drainage, east of Ennis; and in the Pioneer Mountains, east of Wisdom.

MPB-killed LPP was mapped in small- to moderate-size groups throughout much of the Pioneer Range. Though only a small percentage of it was ground checked, we believe much of it was actually killed by IPS or other secondary bark beetles. Secondary bark beetle outbreaks are more weather-related and pose a less serious threat to uninfested stands than does MPB.

Bitterroot Reporting Area

Small, scattered groups of PP killed by MPB and WPB were observed in the East Fork Bitterroot River drainage, east of Sula; and in the Spring Creek drainage west of Sula.

In many of those same areas, at higher elevations, DFB mortality was recorded. In addition, small groups of DFB-killed DF were noted in the vicinity of Skalkaho Pass, near Black Bear Guard Station; and in the West Fork drainage, south of Painted Rocks Lake. Still others were mapped in the Nez Perce Fork of the Bitterroot River, west into the Selway-Bitterroot Wilderness.

Ground evaluations were made in selected DFB-infested stands on the Sula and West Fork RDs. No 1992 attacks were observed at any of those locations. Though the number of areas we ground checked was small, we believe the infested area on the Forest is decreasing in both scope and intensity.

Clearwater Reporting Area

DFB-infested area increased markedly in 1992--to more than 2,200 acres; just under 250 acres had been infested in 1991. The largest infested areas were found along the Lochsa River, southwest of Lolo Pass; north and east of Lowell; and along the Middle Fork of the Clearwater River, east of Kamiah. Other beetle-killed groups were observed in the upper portion of the North Fork Clearwater River. Ground checking in a few accessible stands revealed decidedly declining populations--from an average of 17 new attacks in 1991 to seven in 1992.

Additional bark beetle-caused damage was generally light, and scattered throughout the Forest. MPB-killed WWP and GF, which had been killed by FE, were noted east of French Mountain. Groups of ES, killed by ESB, were also mapped south and east of there. In addition to scattered groups of DFB, numerous small groups of trees killed by WBBB and FE were observed in the North Fork Clearwater drainage.

Coeur d'Alene (IPNFs) Reporting Area

Many small and scattered groups of beetle-killed trees were recorded to the east and south of Coeur d'Alene (CdA) in 1992. Major increases were noted in the amount of DFB-caused mortality. On the Wallace RD alone, infested area increased from 182 acres in 1991 to more than 1,400 acres in 1992. In that same area, mostly-small (5- to 20-tree) groups of faders of several tree species, were noted. WWP and LPP killed by MPB and GF killed by FE were recorded. Higher concentrations of dead WWP, GF, and DF were noted both north and south of Interstate-90, between Wallace and Kellogg. South of Coeur d' Alene, near Harrison, several groups of WPB-killed PP were mapped.

Craig Mountains (ID) Reporting Area

Several years ago, major outbreaks of MPB in both LPP and PP existed in the Craig Mountains. Particularly in the vicinity of Soldier Meadows Reservoir, thousands of trees were killed. Now, though those epidemics have subsided, scattered groups of beetle-killed trees can still be observed. MPB is still found infesting both LPP and PP. In addition, numerous scattered groups of FE-killed GF were mapped from the Snake River east to Mission Creek.

Custer Reporting Area

Outbreaks of IPS in LPP killed hundreds of trees on more than 2,000 acres on the Beartooth RD and surrounding lands in 1992. Large groups of faders were noted in the Stillwater and West Fork Stillwater River drainages, near Initial Creek Campground, and in the vicinity of Meyer Creek Guard Station. Other areas of significant mortality were in the Rock Creek drainage west of Red Lodge and in LPP stands south of there.

Scattered groups of faded PP, killed by MPB, and perhaps IPS, were noted on the Ashland RD. Those infestations, located between Ashland and Fort Howes, and south of Fort Howes, are small and not yet of major concern.

Deerlodge Reporting Area

As recently as a few years ago, the MPB outbreak in LPP stands near Delmoe Lake extended to several thousand acres. In 1991, it covered just over 800 acres. In 1992, it has been reduced to less than 30 acres. To the east, near Boulder, a few small groups of beetle-killed trees can be found along the Little Boulder River.

On the Philipsburg RD, scattered, small groups of dead LPP, reportedly killed by MPB (which, in fact, were mostly IPS); and groups of SAF, killed by WBBB, were observed in the Flint Creek Range, east of Philipsburg. Small groups of faders, both DF and PP--the latter killed by WPB--were recorded south of I-90, between Bearmouth and Beavertail Hill. Other groups of DFB-killed trees were seen east of Douglas Creek Guard Station.

Flathead IR

Groups of PP, killed by both MPB and WPB, were mapped throughout the southern portion of the Reservation. Several groups were concentrated near Mission Reservoir. Small, more-scattered groups were noted along the east side. In the northeast corner, several groups of LPP, killed by MPB, were observed. These infestations are part of the serious infestations found in the Crane Mountain area, on the adjacent Flathead NF. In the northern part, west from Flathead Lake to Niarada, scattered groups of MPB-killed PP were found. In the extreme northwest corner, and down the western side to Hot Springs, LPP faders, killed by MPB, were recorded. Infestations near Rainbow Lake are just across the ridge from serious outbreaks in the Little Thompson River drainage on the Lolo NF.

Small groups of DFB-killed DF were also found throughout the type. Most were seen in the southern one-third of the Reservation.

Flathead Reporting Area

In tributaries of the North Fork Flathead River (Glacier View RD), scattered groups of LPP and WWP killed by MPB still exist in the Canyon Creek, McGinnis Creek and Coal Creek drainages (Figures 7 and 8). Though mere vestiges of the once-massive outbreaks of a decade ago, significant amounts of WWP are still being killed in the southern portion of the District. Several small groups of LPP faders were noted in the Yakinikak Creek drainage to the north, and numerous groups of high-elevation SAF have been killed throughout the drainage by WBBB. Bigger groups of WBBB-killed SAF were recorded around Cyclone Lake. Some DFB-killed groups can still be found in the Big Creek and Whale Creek drainages, but they have decreased in the last year or so. Relatively minor amounts of whitebark pine (WBP) have been killed by MPB in high-elevation stands throughout the District.

On the Island Unit of the Swan Lake RD, west of Kalispell, a few small groups of MPB-killed LPP remain. These, too, have declined markedly in the past 5-6 years. On lower elevation sites in that area, some large-diameter PP are being killed by MPB, WPB, and/or IPS.

On the Hungry Horse RD, near Firefighter Mountain, and along both sides of Hungry Horse Reservoir, MPB continued to kill large amounts of both LPP and WWP. The most significant amounts of mortality, occurring in WWP, was recorded in the Logan Creek drainage and near Betty Creek Work Center. Scattered groups of dead LPP and WWP were also noted along the Middle Fork Flathead River. Small, widely scattered groups of DFB-killed trees were noted northeast of Spotted Bear. A more significant DFB infestation, containing many 1992 attacks, was located above Logan Creek, about a mile east of the Reservoir.

The most important MPB infestations on the Forest are in the Crane Mountain area on the Swan Lake RD. First observed in 1986, that infestation declined in 1988 due to aggressive management activities. It has resurged in still-susceptible stands, however, and increased in infested area from just less than 1,800 acres in 1991 to more than 2,700 in 1992. Ground evaluations showed infested trees nearly doubled from 1991 to 1992. Infested trees per acre averaged 25.7 last year, and 51.6 in 1992 (Table 4). The large acreage of green LPP suggests that unless stand conditions are altered, populations will continue to increase for the next year or two. Elsewhere on the District, WWP killed by MPB were noted in small groups south of Swan Lake, near Point Pleasant and Soup Creek. DFB-killed groups were also observed near Holland Lake.

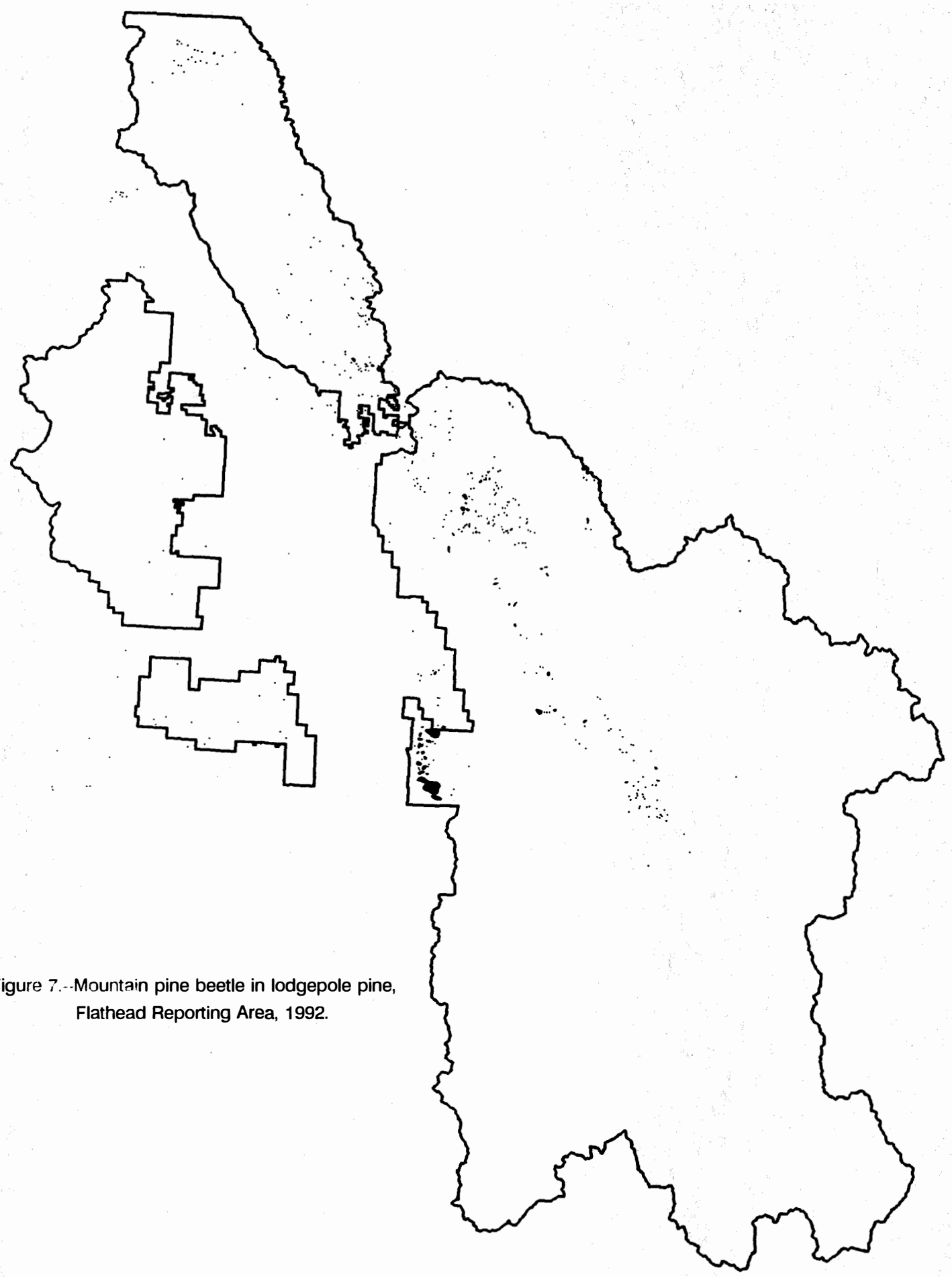

Figure 7.--Mountain pine beetle in lodgepole pine, Flathead Reporting Area, 1992.

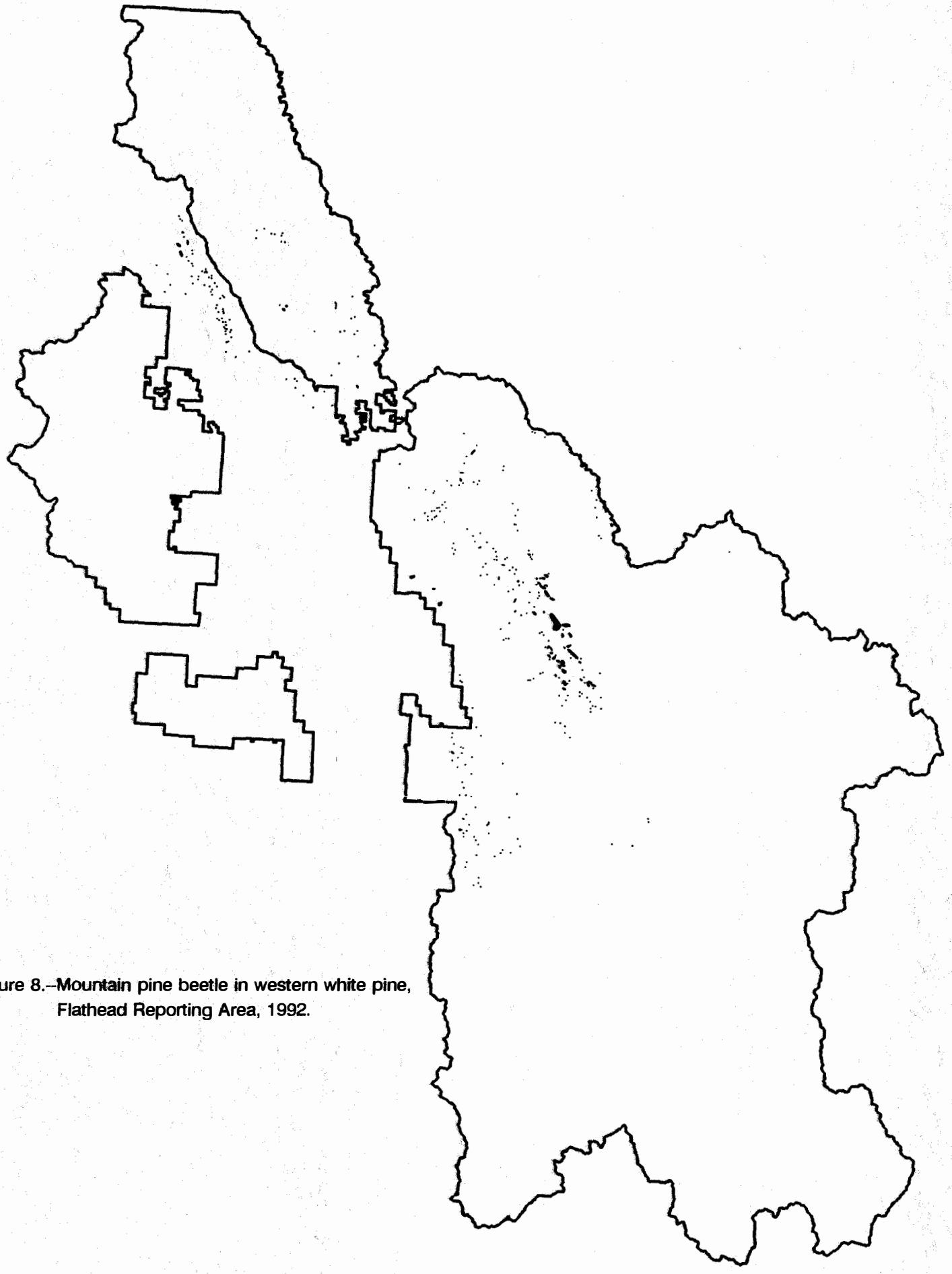

Figure 8.--Mountain pine beetle in western white pine, Flathead Reporting Area, 1992.

Table 4.--Acres of host infested and pine species per acre killed by MPB
Flathead reporting area, 1991 and 1992.

		- - - Acres infested - - -		- - - Average no. trees/acre killed - - -			
Ownership	Host	1991	1992	Older	1991	1992	To date
Glacier View RD	LPP	1,010	266	-	-	-	-
	PP	0	4	-	-	-	-
	WBP	98	52	-	-	-	-
	WWP	1,885	93	-	-	-	-
Hungry Horse RD	LPP	1,201	745	31.0	32.1	32.7	95.8
	WBP	18	16	-	-	-	-
	WWP	5,921	2,123	10.9	18.5	6.2	35.6
Spotted Bear RD	LPP	404	345	23.0	42.0	23.8	88.8
	PP	8	0	-	-	-	-
	WBP	2	8	-	-	-	-
	WWP	263	175	2.2	34.6	9.6	46.4
Swan Lake RD	LPP	1,794	2,765	21.4	25.7	51.6	98.7
	PP	18	24	-	-	-	-
	WBP	0	4	-	-	-	-
	WWP	278	233	-	-	-	-
Tally Lake RD	LPP	376	8	-	-	-	-
	PP	2	0	-	-	-	-
	WWP	2	0	-	-	-	-
State, private, other	LPP	301	121	-	-	-	-
	PP	106	94	-	-	-	-
	WWP	125	60	-	-	-	-
Total/weighted avg.	**LPP**	**5,086**	**4,250**	**23.6**	**30.3**	**42.3**	**96.2**
	WWP	**8,475**	**2,684**	**6.5**	**26.6**	**7.9**	**41.0**
Species Total		**13,812**	**7,136**				

Garnet Mountains (MT) Reporting Area

No major concentrations of bark beetles exist in the reporting area. Small and scattered groups of dead trees attributable to DFB, WPB, and MPB were observed. Several groups were mapped between Bonner and Bear Creek, and along Highway 200 between Potomac and Greenough. The latter were predominantly 1- to 10-tree groups of dead PP. A few groups of LPP killed by MPB were noted east of Bonner and MPB threatens higher elevation LPP stands on BLM land near the head of North Fork Elk Creek.

Gallatin Reporting Area

IPS outbreaks currently present the most significant bark beetle problem on the Forest. Large groups of LPP have been killed in many parts of the Gallatin Canyon, around West Yellowstone and in the Boulder River drainage. Most damaging infestations were mapped around Hebgen Lake and north along the Gallatin River to Bozeman. Particularly large groups were noted near Sage Creek and Monument Creek. Nearer Bozeman, many faders were recorded near Hyalite Reservoir and Mount Chipper. In the Boulder River drainage, south of Big Timber, and south of Sliderock Mountain, major amounts of IPS-killed trees were observed. Other groups were mapped southeast Livingston and along the northern boundary of the Absaroka-Beartooth Wilderness. In total, IPS-infested acres increased, Forest-wide, tenfold--from just less than 2,800 in 1991 to almost 28,000 in 1992. It is possible some of this damage has been caused by a combination of MPB and IPS. In a few areas ground checked, some MPB was noted. The vast majority, however, is attributable to IPS.

A near four-fold increase in DFB-infested acres--from 1,200 to 4,600--occurred on the Forest in 1992, as well. Most of that is still found in the Mill Creek drainage, Livingston RD. There is evidence that the infestation is finally subsiding in response to sanitation/salvage efforts and the judicious use of DFB tree baits. Ground-collected data showed a decline in the average number of infested trees, per surveyed group, from 21 in 1991 to 6 in 1992. Other DFB-killed DF were observed in small, scattered groups east of the Yellowstone River, between Chico Hot Springs and Livingston; in the Gallatin Range, from Yellowstone NP to Bozeman; and in the Bridger Mountains, near Horsethief Mountain.

WBBB infestations also increased significantly in 1992. Approximately 2,000 acres had been recorded in 1991. That increased to more than 32,000 acres this year. Notable infestations were mapped in the Boulder River drainage, and in high-elevation stands of SAF in the Gallatin, Bridger and Crazy Mountains.

Helena Reporting Area

DFB is also the major bark beetle pest in the Helena reporting area at present. Significant outbreaks still exist on lands of several ownerships west of Lincoln. Though data collected during ground surveys suggest most infestations are declining, there are still viable populations near Kershaw Mountain and in the Wasson, Moose, and Little Moose Creek drainages. Smaller infestations are located in Copper Creek and east of Canyon Ferry Reservoir.

Small infestations of MPB in LPP were noted near Baldy Mountain and east to Willow Creek (Lincoln RD). Others were recorded south of Helena, east of Canyon Ferry and near Deep Creek Ranger Station. PP stands affected by MPB were observed west of Holter Lake and south of Helena.

WBBB infestations were noted above Keep Cool Creek and near Ogden Mountain. Just over 250 acres were recorded, Forest-wide.

Kaniksu (IPNFs) Reporting Area

Many 10- to 20-tree groups of LPP killed by MPB were mapped east of Bonners Ferry--in the Boulder Creek drainage and north of there, along the Moyie River. Those infestations increased markedly in 1992--from 255 acres to 1,200. Permanent plots were established at two sites, near Deer Ridge and Copper Mountain, to monitor potential population increases in susceptible LPP stands.

Likewise, increases in MPB-killed WWP stands were significant in 1992. As noted earlier, some of the increase is likely due to white pine blister rust, or some combination of blister rust and beetles. The area mapped, however, on the three RDs in the reporting area--Bonners Ferry, Sandpoint and Priest River--increased from 64 acres in 1991 to more than 4,200 in 1992. Many of those groups were observed in the Selkirk Mountains, just south of the Canada/U.S. border; west of Priest Lake; and along the Lower West Branch Priest River.

In addition, there were small, scattered groups of DFB- and FE-killed trees throughout the area. None were of significance. Some scattered groups of WBBB-killed SAF were also noted in the Selkirk Mountains.

Kootenai Reporting Area

Some of the more significant MPB outbreaks still existing in the Region are found on the Kootenai NF. Even so, the infested area declined notably in 1992. More than 107,000 acres--of all ownerships--were recorded in 1991; only 32,000 were mapped in 1992 (Figure 9). On the west side of Lake Koocanusa, major infestations are still located in the vicinity of Lawrence Mountain. In that area, large groups of faders with many 1992 attacks can be found. To the east, populations are concentrated near Sutton Creek, Helmer Mountain, and in the McGuire Creek drainage. Some MPB-killed PP were noted in the Fivemile Creek area. In the upper Yaak River drainage, and over into the Sullivan Creek drainage, other active infestations were recorded. Large groups of beetle-killed trees were found in the following areas: Sullivan Creek, Dodge Creek, Young Creek, Kelsey Creek, South Fork Yaak River, and near Flatiron Mountain. In the lower Yaak, active infestations were found near Burnt Creek, Independence Creek, and Newton Mountain. Other, smaller groups were noted east of Troy and south of Savage Lakes. Forest-wide, for all ground data collected--16 plot areas--there was a decrease in new attacked trees per acre. In 1991, an average of 32 trees per acre had been killed. That declined to 14 trees per acre in 1992 (Table 5).

In other parts of the Forest, scattered dead WWP, WBP, LPP, and SAF were recorded near Therriault Lakes. The former three were killed by MPB. The latter by WBBB. A few small groups of DF, killed by DFB, were found near Bull Lake and around Billiard Table Mountain.

Lewis and Clark Reporting Area

Bark beetles are not a major management concern on the Lewis and Clark at the present time. In past years, MPB has killed significant amounts of PP. Now, virtually endemic populations exist. Widely scattered, small groups of MPB/IPS-killed LPP were seen in the Castle Mountains, southeast of White Sulphur Springs. In the Highwood Mountains, east of Great Falls, other dead LPP were noted. We believe MPB is mostly commonly encountered in those stands. SAF killed by WBBB were recorded in the Little Belt Mountains southwest of Stanford, in the Tenderfoot Experimental Forest, in the Castle Mountains, and in the northern part of the Crazy Mountains. Other small groups were noted in both the Big and Little Snowy Mountains, south of Lewistown. Minor amounts of DFB-killed DF were observed in the Little Belts and the Big Snowies. Near the head of Hopely Creek, south of Stanford (Musselshell RD), ES on just over 100 acres were observed to have been killed by ESB.

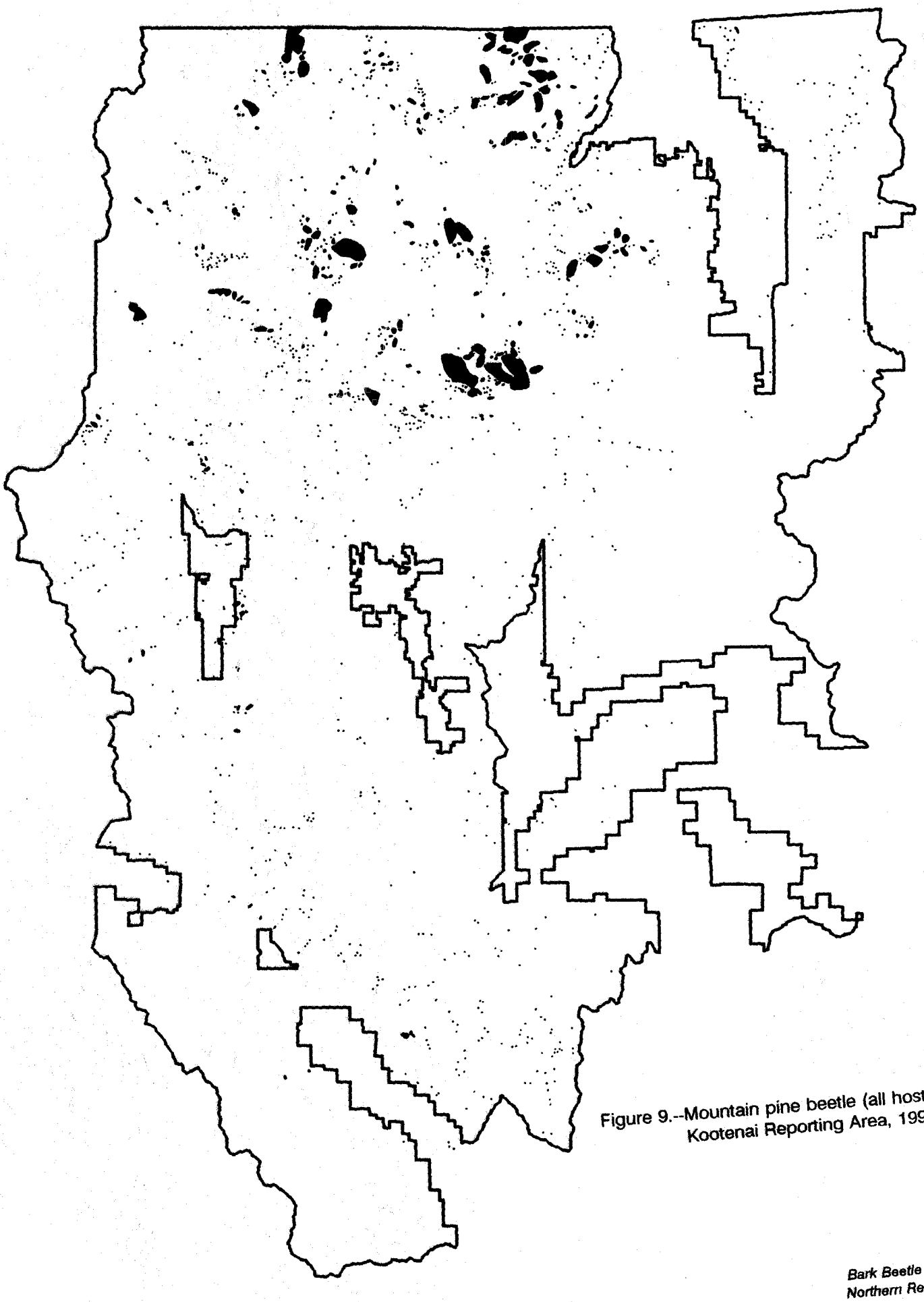

Figure 9.--Mountain pine beetle (all host species), Kootenai Reporting Area, 1992.

Table 5.--Acres infested and trees per acre killed by MPB,
Lolo reporting area, 1991 and 1992.

	- - - - Acres infested - - - -			- - - Average no. trees/acre killed - - -			
Ownership	Host	1991	1992	Older	1991	1992	To date
Missoula RD	LPP	104	13	-	-	-	-
	PP	12	32	-	-	-	-
Ninemile RD	LPP	636	72	7.2	10.5	14.4	32.1
	PP	16	276	30.6	27.2	28.8	86.6
Plains RD	LPP	17,249	10,266	13.8	43.9	46.9	104.6
	PP	79	66	-	-	-	-
	WWP	0	2	-	-	-	-
Seeley Lake RD	LPP	33	2	-	-	-	-
	PP	29	0	-	-	-	-
	WBP	2	0	-	-	-	-
Superior RD	LPP	85	2,419	13.6	39.1	42.7	95.4
	PP	38	415	-	-	-	-
	WWP	0	26	-	-	-	-
Thompson Falls RD	LPP	6,430	3,158	53.9	39.2	13.9	107.0
	PP	14	14	-	-	-	-
	WBP	4	2	-	-	-	-
	WWP	119	26	-	-	-	-
Garnet Mountains	LPP	28	18	-	-	-	-
	PP	237	144	-	-	-	-
State, private, other	LPP	3,089	764	-	-	-	-
	PP	278	170	-	-	-	-
	WBP	0	2	-	-	-	-
Total/weighted avg.	**LPP**	**27,654**	**16,712**	**15.1**	**39.1**	**40.9**	**95.1**
	PP	**703**	**1,117**	**30.6**	**27.2**	**28.8**	**86.6**
Species total		**28,482**	**17,887**				

Lolo Reporting Area

The Lolo NF, specifically the Plains/Thompson Falls RD, is the site of the third major area of MPB in LPP in the Region. That infestation, for the most part within the Little Thompson River and associated drainages, decreased somewhat in infested area, but ground-collected data indicated a nearly static trend. In 1991, the infested area on that District covered more than 23,000 acres. In 1992, that had been reduced to just over 13,000 acres (Figure 10). Ground-plot data, however, showed virtually the same infestation rate--about 45 trees per acre--for both 1991 and 1992 (Table 6). An area of apparently building populations is on the southern edge of the District, along the Sanders/Mineral County divide, west of Combest Peak.

The infested area on the Superior RD--of which that outbreak near Combest Peak is a part--increased from 85 acres in 1991, to more than 2,400 in 1992. Ground-collected data showed a slightly increasing trend--from 39 to 42 trees per acre attacked, 1991 to 1992, respectively. Elsewhere on the District, specifically in the Prospect Creek drainage, beetle-killed trees were scattered. Thousands of acres of LPP, in a size and age class of near susceptibility to MPB, exist in the Prospect Creek area. It could be the site of important beetle outbreaks in the next decade or so.

Small and scattered groups of LPP faders were noted on the Ninemile RD. An approximately 200-acre group of PP was killed by MPB near Blue Ridge Mountain. On the Missoula RD, and surrounding private lands, widely scattered groups of PP and some LPP were killed by MPB, WPB, and IPS.

Scattered groups of SAF, PP, LPP and DF were killed in various parts of the Forest and lands of other ownerships. Noticeable groups were recorded in the Swan Valley near Salmon Lake and Seeley Lake. DFB-killed groups were mapped in the Rock Creek drainage, east of Missoula and in the Prospect Creek drainage, west of St. Regis. None were thought to be significant.

Nez Perce Reporting Area

DFB outbreaks increased dramatically on the Selway RD, along the Selway River, west of Lowell. That infestation grew from less than 850 acres in 1991 to more than 4,200 in 1992. Other groups were found scattered above the Clearwater River, east of Grangeville. On the Red River and Salmon River RDs, there were also significant increases in the areas containing DFB-killed DF. On the former, beetle-killed trees were noted west of Red River. On the latter, dead trees were mapped on the Island Unit, west of Riggins; and along Slate Creek, both north towards Grangeville and south towards the Salmon River. Forest-wide, the infested area increased from just over 1,300 acres to more than 6,900 acres from 1991 to 1992. Though not all areas were evaluated on the ground, the few that were suggest that beetle populations may already be declining. We will follow those infestations closely for the next year or two.

In other parts of the Forest, scattered groups of SAF killed by WBBB; GF killed by FE; and ES killed by ESB were observed. Groups of beetle-killed GF ranged in size from 4 to 50 trees--particularly evident long Meadow Creek, northeast of Elk City. Dead SAF were found in large groups south of Elk City and west of Red River.

St. Joe (IPNFs) Reporting Area

Widely scattered groups of DF, killed by DFB, were found from Bovill, west to Potlatch, throughout much of the CdA IR, and along the St. Joe River from Kerrick to Red Ives. The major DFB outbreak, which existed on the Avery RD a couple of years ago, has largely subsided. Many of those infested stands have been effectively treated to reduce the number of infested and threatened DF.

FE populations were recorded east of Moscow, to Boulder Creek; and on the CdA IR, east to the Forest boundary. In the same area, PP killed by WPB were noted.

Small and scattered groups of MPB-killed WWP were observed along the St. Joe River and south of the river along Marble Creek. Some dead SAF, killed by WBBB, were seen at higher elevations in the same area.

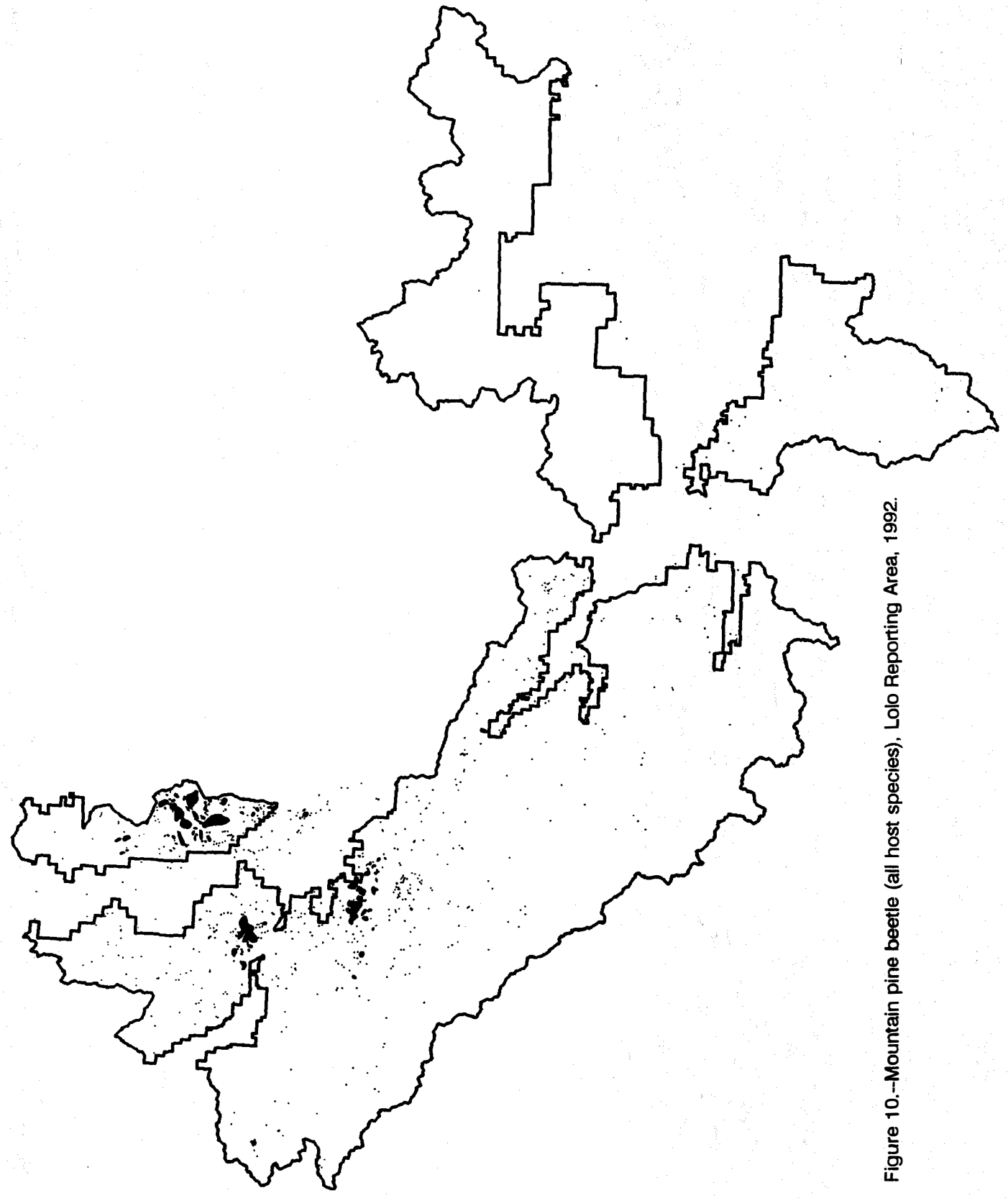

Figure 10.--Mountain pine beetle (all host species), Lolo Reporting Area, 1992.

Table 6.--Acres infested and trees per acre killed by MPB, Kootenai reporting area, 1991 and 1992.

	- - - - Acres infested - - - -			- - - Average no. trees/acre killed - - -			
Ownership	Host	1991	1992	Older	1991	1992	To date
Cabinet RD	LPP	210	556	-	-	-	-
	PP	16	46	-	-	-	-
	WWP	49	84	-	-	-	-
Fisher River RD	LPP	268	93	-	-	-	-
	PP	62	102	-	-	-	-
	WWP	0	16	-	-	-	-
Fortine RD	LPP	1,379	80	-	-	-	-
	PP	10	10	-	-	-	-
	WBP	39	28	-	-	-	-
	WWP	30	29	-	-	-	-
Libby RD	LPP	12,077	3,740	100.6	22.1	4.5	127.2
	PP	469	32	-	-	-	-
	WBP	4	0	-	-	-	-
	WWP	32	82	-	-	-	-
Rexford RD	LPP	70,851	17,510	34.9	38.8	21.4	95.1
	PP	224	386	-	-	-	-
	WBP	0	20	-	-	-	-
	WWP	202	81	-	-	-	-
Three Rivers RD (Troy)	LPP	4,827	980	-	-	-	-
	PP	6	32	-	-	-	-
	WWP	154	64	-	-	-	-
Three Rivers RD (Yaak)	LPP	14,505	8,657	31.3	26.0	7.1	64.4
	PP	6	174	-	-	-	-
	WWP	73	177	-	-	-	-
State, private, other	LPP	3,184	540	-	-	-	-
	PP	146	64	-	-	-	-
	WWP	12	20	-	-	-	-
Total/weighted avg.	**LPP**	**107,301**	**32,156**	**37.5**	**32.1**	**14.0**	**83.6**
	PP	**939**	**846**	**-**	**-**	**-**	**-**
Species total		**108,835**	**33,603**				

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SCIENTIFIC NAMES

Beetles

Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopkins
Pine engraver	*Ips pini* Say
Fir engraver	*Scolytus ventralis* LeConte
Western pine beetle	*Dendroctonus brevicomis* LeConte
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Western balsam bark beetle	*Dryocoetes confusus* Swaine
Red turpentine beetle	*Dendroctonus valens* LeConte

Hosts

Lodgepole pine	*Pinus contorta* var. *latifolia* Engelmann
Ponderosa pine	*Pinus ponderosa* Laws
Western white pine	*Pinus monticola* Douglas
Whitebark pine	*Pinus albicaulis* Engelmann
Limber pine	*Pinus flexilis* James
Douglas-fir	*Pseudotsuga menziesii* var. *glauca* (Beissn.) Franco
Grand fir	*Abies grandis* (Douglas) Lindl.
Subalpine fir	*Abies lasiocarpa* (Hook.) Nutt.
Engelmann spruce	*Picea engelmannii* Parry